



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/669,568

09/25/2003

Tatsuhiko Koide

65933-046

4009

7590

09/05/2006

McDERMOTT, WILL & EMERY
600 13th Street, N.W.
Washington, DC 20005-3096

EXAMINER

MAI, ANH D

ART UNIT	PAPER NUMBER
----------	--------------

2814

DATE MAILED: 09/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/669,568	Applicant(s) KOIDE, TATSUHIKO	
	Examiner Anh D. Mai	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 July 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 6, 12, 13 and 15-26 is/are pending in the application.
- 4a) Of the above claim(s) 16-26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 6, 12, 13 and 15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 24, 2006 has been entered.

Status of the Claims

2. Amendment filed July 24, 2006 has been entered. Claims 5, 11, 14, 27 and 28 have been cancelled. Claims 6, 12, 13 and 15 have been amended. None-elected invention, claims 16-26 have been withdrawn. Claims 6, 12, 13 and 15-26 are pending.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 13 and 15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 13, line 3, recites: a dielectric film having a substantially **uniform composition** including a porous portion.

The rest of the claim lines 4-8, recites: wherein pores in said porous portion are distributed in a relatively **lower density in the proximity of lower surface** of said dielectric

Art Unit: 2814

film, and the dielectric film includes an area where density of said pores varies gradually toward the upper surface or the lower surface of said dielectric film.

The term uniform composition means the same everywhere, however, the density of the pores is lower toward the lower surface then the composition is no longer uniform.

The limitations of the claim, e.g., uniform composition and density of said pores varies, are contradicting each other.

Therefore, the claim is indefinite.

Further, lines 4-5, recites: relatively lower density in the proximity of lower surface of said dielectric film.

Lines 7-8 recites: where density of said pores varies gradually toward the upper-surface or the lower surface of said dielectric film.

These two terms does not seem to be agreeable with each other.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Art Unit: 2814

4. Claim 13 is rejected under 35 U.S.C. 102(b) as being anticipated by Gnade et al. (U.S. Patent No. 5,494,858) of record.

With respect to claim 13, as best understood by the examiner, Gnade teaches a semiconductor device as claimed including:

a semiconductor substrate (22); and
a dielectric film having a substantially uniform composition including a porous portion;
wherein pores in the porous portion are distributed in a relatively lower density in the proximity of lower surface of the dielectric film, and

the dielectric film includes an area where density of the pores varies gradually toward the upper surface or the lower surface of the dielectric film. (See Fig. 3C-D, col. 7, lines 30-47).

5. Claim 13 is rejected under 35 U.S.C. 102(e) as being anticipated by Giles (U.S. Patent No. 6,963,137).

With respect to claim 13, as best understood by the examiner, Gnade teaches a semiconductor device as claimed including:

a semiconductor substrate (11); and
a dielectric film (10) having a substantially uniform composition including a porous portion (a);

wherein pores in the porous portion are distributed in a relatively lower density in the proximity of lower surface of the dielectric film (10), and

the dielectric film (10) includes an area where density of the pores varies gradually toward the upper surface or the lower surface of the dielectric film. (See Fig. 1).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 6 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. (U.S. Patent No. 6,806,185) in view of Gnade '858.

With respect to claim 6, Li teaches a semiconductor device substantially as claimed including:

a semiconductor substrate (10); and

a dielectric film including a porous film (16b') and a non-porous film (18b') in contact therewith formed on the semiconductor substrate (10),

wherein the porous film (16b') and the non-porous film (18b') are substantially of an identical composition,

a metal interconnect (26a) is provided in the dielectric film, such that an upper surface of the metal interconnect (26a) and that of the dielectric film are aligned in the same plane. (See Fig. 4).

Thus, Li is shown to teach all the features of the claim with the exception of explicitly disclosing the pores are distributed in a relatively lower density in the proximity of an upper surface of the dielectric film, and the dielectric film includes an area where the density of said pores varies gradually toward the upper surface of the dielectric film.

Art Unit: 2814

However, Gnade a porous film having pores are distributed in a relatively lower density in the proximity of an upper surface of the dielectric film, and the dielectric film includes an area where the density of said pores varies gradually toward the upper surface of the dielectric film. (See Fig. 3C-D, col. 7, lines 30-47).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention was made to form the porous film of Li having relatively lower pores density in the proximity of the upper surface and includes an area where pores density varies gradually toward the upper surface as taught by Gnade to provide a strong top surface while the porous core reduces capacitance coupling.

With respect to claim 12, Li teaches a semiconductor device substantially as claimed including:

a semiconductor substrate (10); and

a dielectric film including a porous film (16b') and a non-porous film (18b') in contact therewith formed on the semiconductor substrate (10),

wherein the porous film (16b') and the non-porous film (18b') both contain Si, O and C, and

a metal interconnect (26a) is provided in the dielectric film, such that an upper surface of the metal interconnect (26a) and that of the dielectric film are aligned in the same plane. (See Fig. 4).

Thus, Li is shown to teach all the features of the claim with the exception of explicitly disclosing the pores are distributed in a relatively lower density in the proximity of an upper surface of the dielectric film, and the dielectric film includes an area where the density of said pores varies gradually toward the upper surface of the dielectric film.

However, Gnade a porous film having pores are distributed in a relatively lower density in the proximity of an upper surface of the dielectric film, and the dielectric film includes an area where the density of said pores varies gradually toward the upper surface of the dielectric film. (See Fig. 3C-D, col. 7, lines 30-47).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention was made to form the porous film of Li having relatively lower pores density in the proximity of the upper surface and includes an area where pores density varies gradually toward the upper surface as taught by Gnade to provide a strong top surface while the porous core reduces capacitance coupling.

7. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gnade '858 or Giles '137 as applied to claim 13 above, and further in view of Li '185.

Gnade or Giles is shown to teach all the features of the claim as described in claim 13 above, with the exception of further comprising a metal interconnect within the dielectric layer including the metal interconnect and the dielectric film are aligned in the same plane.

However, Li teaches a semiconductor device having a metal interconnect (26a) formed within a porous dielectric film (16b'), wherein the metal interconnect and the dielectric film are aligned in the same plane. (See Fig. 4).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention was made to further include a metal interconnect in the dielectric film of Gnade or Giles as taught by Li to form interconnect with low capacitance.

Response to Arguments

8. Applicant's arguments with respect to amended claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (571) 272-1710. The examiner can normally be reached on 8:00AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


ANH D. MAI
PRIMARY EXAMINER